

National Aeronautics and Space Administration



# NASA Town Hall AAS 220th Meeting Anchorage, AK

June 12, 2012

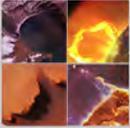
**John Grunsfeld**

**Associate Administrator  
Science Mission Directorate**

**Doug Hudgins**

**Astrophysics Division  
Science Mission Directorate**

[www.nasa.gov](http://www.nasa.gov)

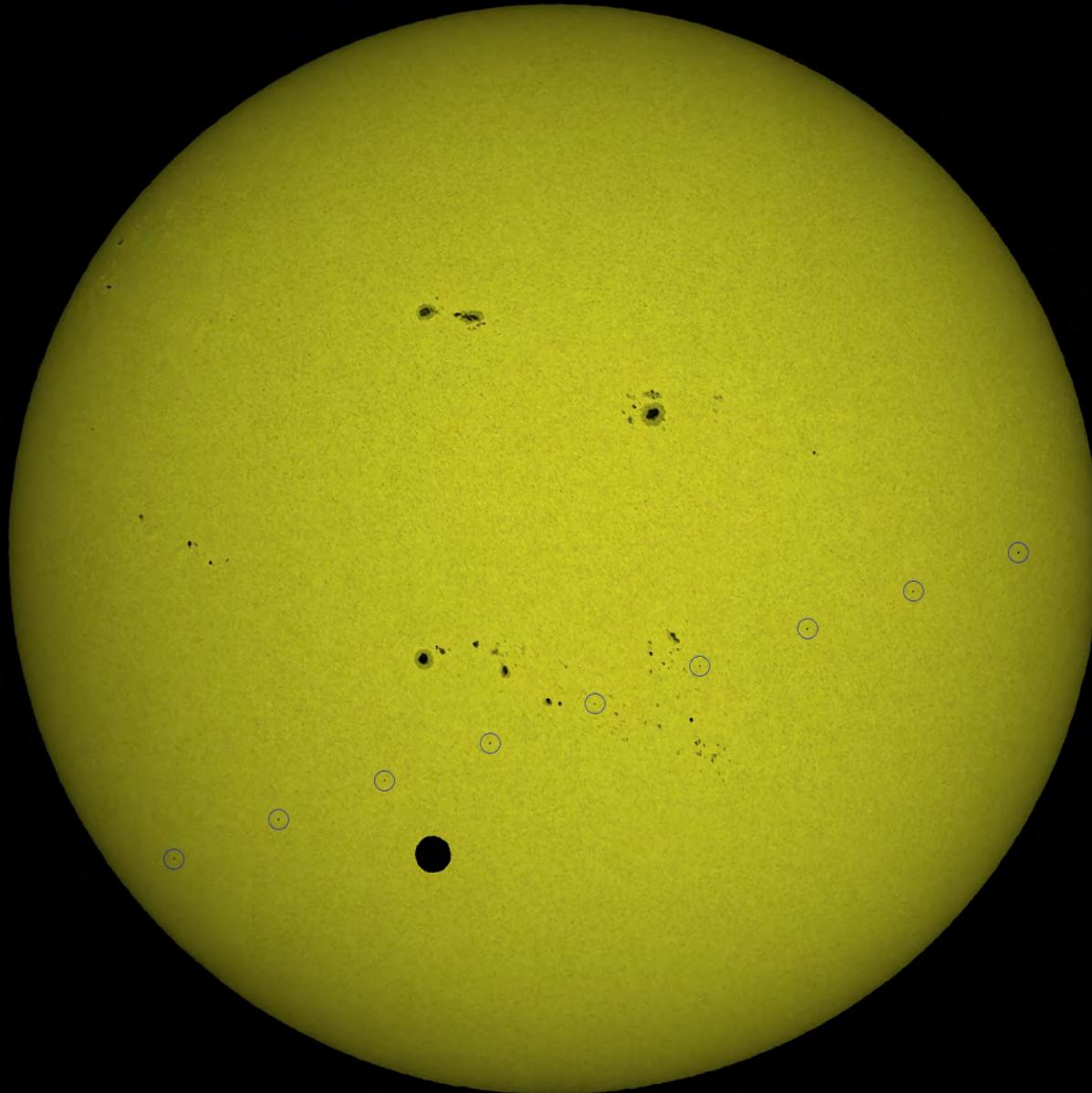


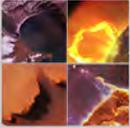
# Welcome Laboratory Astrophysics to AAS





# Venus and HST Transit





<http://mars.ideascale.com/>



# MARS FORUM

PLANNING FOR EXPLORATION

Search Ideas

Science  
Mars Technology  
Exploration Concepts  
approaches  
workshop  
planning input  
Discovery

**Mars is calling... be part of the conversation!**

NASA is planning its [Mars Exploration Program](#) in order to achieve high-priority science goals and address the challenges of sending humans to Mars, all within an environment of very constrained budgets. We're inviting the Mars exploration community and all interested people, regardless of educational or professional background, to engage in a conversation about the future of Mars exploration. Here's how:

**ASK:** Great conversations start with great questions. Throughout June, pose questions related to [the planning effort](#). Comment on, discuss, and offer answers to questions posed by others. Vote for those you feel are most important to be addressed.

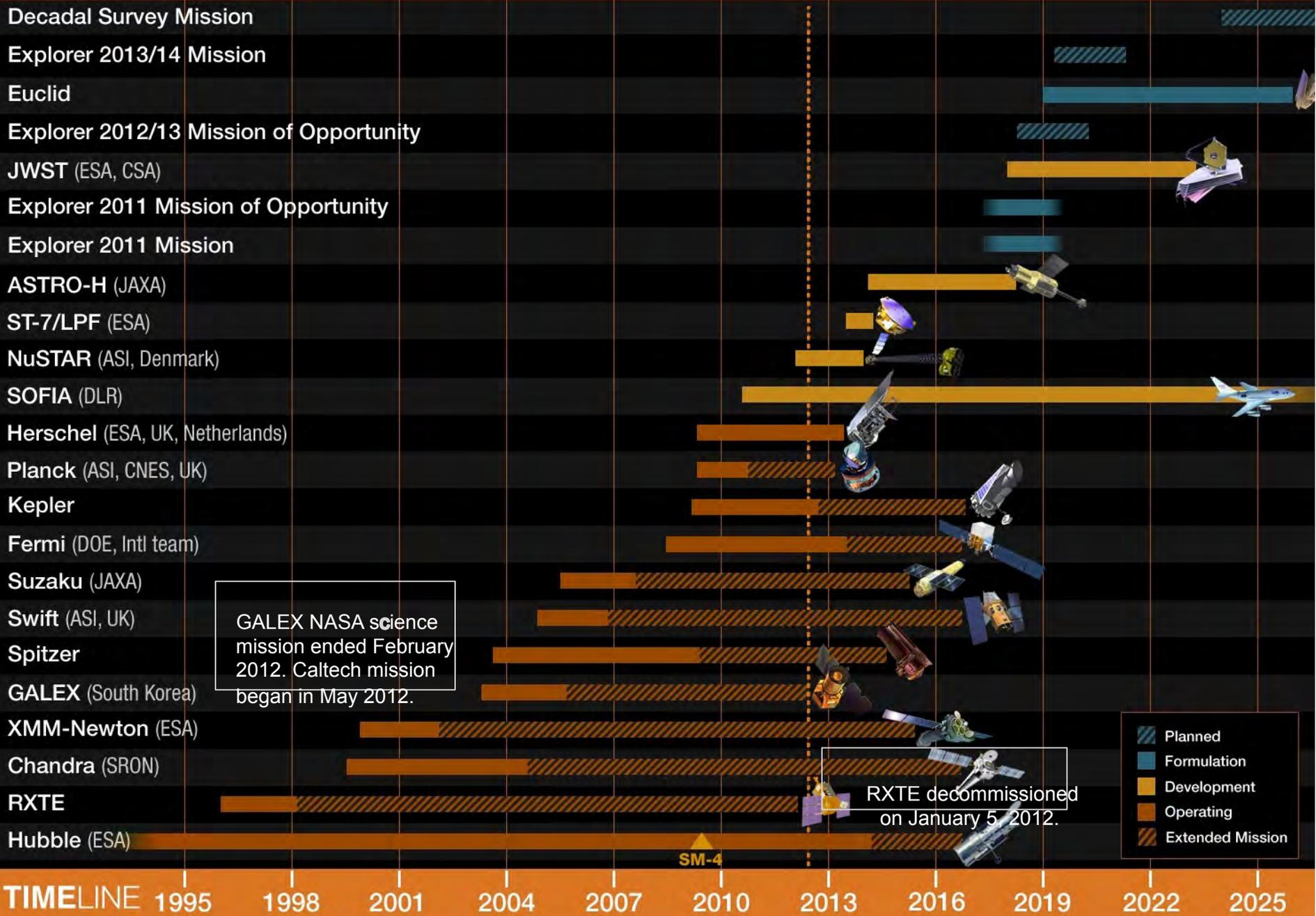
**LISTEN/DISCUSS:** On June 12-14, tune in to the [Concepts and Approaches for Mars Exploration Workshop](#) via Livestream, and participate in the online discussion. Members of the planetary science community will be discussing a variety of technologies and approaches to explore Mars.

**CONTRIBUTE:** Following the workshop, return to this forum to discuss ideas that address the challenges posed either at the workshop or by questions here. We encourage anyone to participate in order to expand and share their knowledge of the challenges and opportunities associated with Mars exploration.

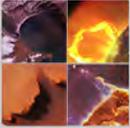
**This dialogue will be open for participation until July 1, 2012.** This forum is an [experiment](#) that we hope will help us better understand public interest, and specific areas to focus our attention on; so please help us make it worthwhile! Thank you for joining us, and remember to play nicely by following the [Code of Conduct](#). Due to resource limitations we can post questions and comments **in English only**.

# Astrophysics Missions timeline

Last updated: May 30, 2012



TIMELINE 1995 1998 2001 2004 2007 2010 2013 2016 2019 2022 2025

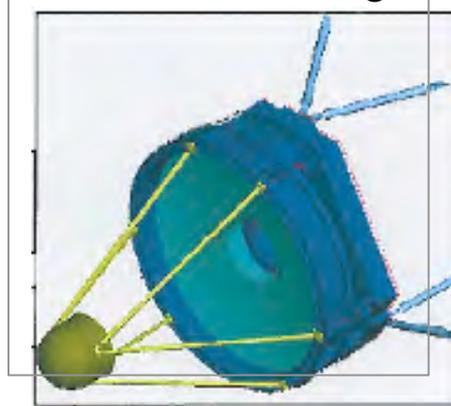


# Telescope Hardware

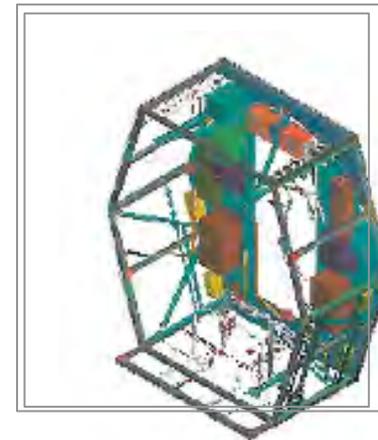
- Over a year ago, the National Reconnaissance Office (NRO) informed NASA that there was residual spacecraft hardware available.
- NASA determined that this equipment could enable many goals in the Astro2010 Decadal Survey Report and accepted transfer of the hardware.
- 2+ sets of space qualified telescope hardware:
  - 2.4m, f/8 with < 20% Obstructed Aperture
  - Field of View: 1.8 degrees unvignetted
  - Wavefront Quality: < 60 nm rms
  - Stable, f/1.2, Lightweight ULE Primary Mirror
  - Actuated Secondary Mirror Positioning



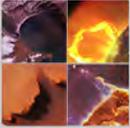
Outer Barrel Assembly



Fore Optics Assembly

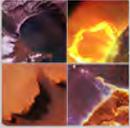


Payload Radiator Subsystem



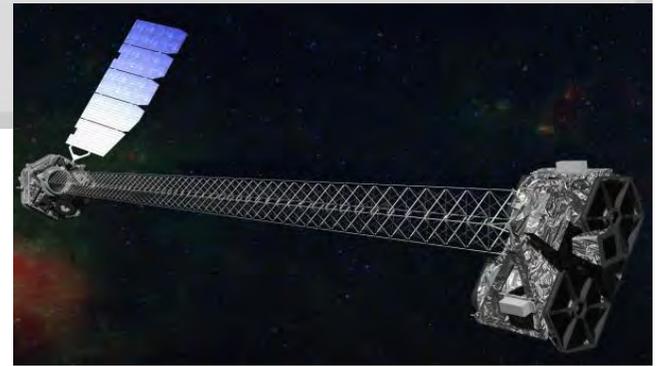
# Telescope Hardware

- The hardware, support equipment, documentation and records are in Rochester at the ITT Exelis facility.
- Astrophysics does not anticipate any funding dedicated to taking advantage of these telescopes until JWST successfully launches.
  - NASA does have limited funding for studying missions that can be initiated later this decade, and for maturing the necessary technology
- Studies of any future mission, including WFIRST and other Astro2010 priorities, should consider whether the use of these telescopes can improve the performance of the potential mission, can shorten the time required for development of the potential mission, or can reduce the cost of the potential mission.



# NuSTAR – Next Launch

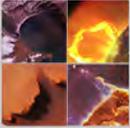
- Pegasus payload fairing reinstalled on May 22, 2012 at Vandenberg Air Force Base (VAFB).
- L-14 news conference held on May 30, 2012 at NASA HQ.
- Flight Readiness Review successfully held on June 1, 2012 at VAFB.
- Ferry flight from VAFB to Kwajalein Test Range was June 5-6, 2012.
- Launch readiness review held on June 11, 2012.
- Launch readiness date is **0730am (AK time) June 13 from Kwajalein.**



*NuSTAR in fairing*



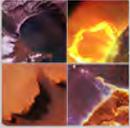
*Pegasus aboard L1011 aircraft*



# GEMS

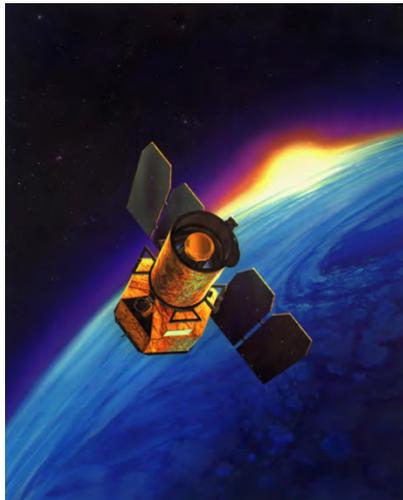
## Gravity and Extreme Magnetism Small (GEMS) Explorer

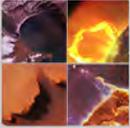
- The NASA Science Mission Directorate Program Management Council met on May 10, 2012 and evaluated the GEMS Key Decision Point C (Confirmation Review).
- Based on this review, the GEMS project has been non-confirmed to enter implementation.
- We are in the process of making formal notification of Congress before terminating the mission.
- The primary rationale for non-confirmation is:
  - Unacceptable pre-Confirmation cost and schedule growth of an AO-selected, cost capped mission.
  - Major descopes were taken during formulation which reduced technical margins; remaining descopes yield relatively small cost savings and/or have high impact on risk.



# GALEX - A New Paradigm

- A Space Act Agreement was signed on May 15, 2012 between NASA and Caltech which loans the spacecraft to Caltech.
- Caltech will operate GALEX with private funds and continue the science mission for as long as three years (extendable).
  - Caltech currently has funds for 5 months of operations from Keck Institute, Weizmann Institute, Cornell University, International consortium (GAMA/Herschel-Atlas/DINGO).
  - No change in data access for the community collected during the Caltech mission: All data will continue to be made publicly available after a 12 month period of exclusivity.
- NASA holds long term liability and is responsible for decommissioning and re-entry.





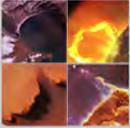
# SOFIA Instrument Selection

- The SOFIA Second Generation Instrument selection was announced on April 17, 2012. The selected proposals were judged to have the best science value and feasible development plans.



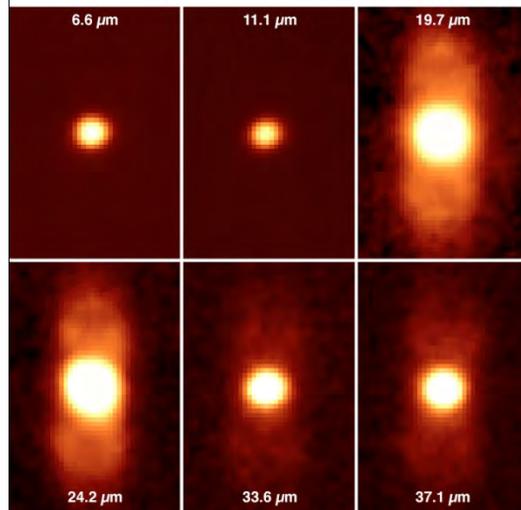
First generation HAWC instrument.

- **The High-resolution Airborne Wideband Camera Polarization (HAWC-Pol)**, Charles Dowell, JPL. Upgrades the HAWC instrument to include the capability to make polarimetric observations at far-infrared wavelengths.
- **HAWC++**, Johannes Staguhn, Johns Hopkins University. Provides a sensitive, large-format detector array to the HAWC-Pol investigation, increasing its observing efficiency.
- Upgraded HAWC will deliver second generation capabilities on a first generation schedule – no delay in HAWC commissioning.
- Next SOFIA instrument AO in 2014.



# SOFIA & Astro-H

SOFIA/FORCAST images of M2-9



## SOFIA

- Aircraft and observatory upgrades continue in Palmdale CA.
- Telescope Assembly completed Line Operations to verify updated software. Verified that most telescope operational issues seen during early science have likely been resolved.

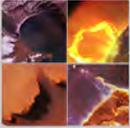
- Eight papers published in Astrophysical Journal Letters, mostly related to FORCAST results
- Twenty-two papers published in special edition of Astronomy and Astrophysics on GREAT results

## Astro-H

- The engineering model (EM) Calorimeter Spectrometer Insert (CSI) to begin cryo functional test Aug 6, 2012.
- All other EM testing was completed by May 31, 2012.



JAXA EM dewar after EM CSI installation



# JWST's First Instrument Arrives!

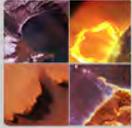
- The joint European-US instrument, the mid-infrared Instrument (MIRI) arrived at GSFC May 29
- MIRI will be
  - $10^4$  times more sensitive than a 30m ground-based telescope
  - $10^4$  faster than *Spitzer* with higher angular resolution
  - critical to early galaxy detection by unique diagnostics enabled by mid-infrared (5--28 microns) coverage
  - able to study star formation shrouded by dust in interacting galaxies
  - the prime instrument for studying protoplanetary disks at unprecedented angular resolution (30-35 AU for nearby systems)
  - capable of spectroscopy of protoplanetary disks and of their descendants, the debris disks, revealing the mineralogy of the dust and the physical conditions of the gas



MIRI boarding BA for its flight to the US



Engineers inspect MIRI at GSFC after arrival



# JWST Since Austin & Upcoming Events

*MIRI @ GSFC*



*“COCOA”*

*“PMBSS”*

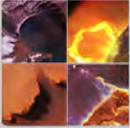
JWST remains within cost and schedule to support a 2018 launch following 2011 replan. First flight instrument delivered (!) and funded schedule critical path slack increased from 13 to 14 months.

## Upcoming Events

CSA Fine Guidance Sensor/NIRISS	July 2012
Completion of JSC Chamber A	Summer 2012
U of Arizona NIRCcam delivery	Fall 2012
ESA NIRSpec delivery	Spring 2013

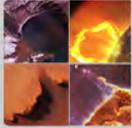


*Sunshield Template #5*



## Euclid – NASA Contribution

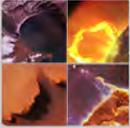
- NASA will contribute Near Infrared Spectrograph and Photometer (NISP) flight subassemblies (detector + ASIC+ cryo-cable = ‘triplet’) that meet ESA’s requirements for testing and characterization.
  - NASA contribution includes manufacture of flight subassemblies by industry followed by NASA characterization and testing of the flight subassemblies.
  - After delivery, ESA will be responsible for integrating the subassemblies into the NISP focal plane.
  - Same division of responsibilities as NASA and ESA agreed for Planck.
- Solicitation for NASA-selected members issued May 23, 2012 as a ROSES amendment (Appendix D.10). Proposals due August 31, 2012.
  - ESA will appoint a NASA-selected member to the Euclid Science Team.
  - The Euclid Consortium will appoint a NASA-selected member to the Euclid Consortium Board and up to 40 NASA-selected members to the Euclid Consortium, commensurate with NASA’s hardware contribution to the mission.
  - NASA-appointed Euclid Consortium members will have the same data rights as European Euclid Consortium members and will be fully integrated into the Euclid Consortium Science Working Groups.



# 2012 Senior Review Results

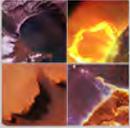
Mission	Result
<b>Chandra</b>	<ul style="list-style-type: none"><li>- Fully fund as budgeted thru FY16</li><li>- Augment Guest Observer Program at 1/2 Project request</li></ul>
<b>Fermi</b>	<ul style="list-style-type: none"><li>- Mission extension thru FY16</li><li>- Reduced budget starting in FY14</li></ul>
<b>Hubble</b>	<ul style="list-style-type: none"><li>- Fully fund as budgeted</li></ul>
<b>Kepler</b>	<ul style="list-style-type: none"><li>- Extend mission operations thru FY16</li><li>- Augment Guest Observer and Participating Science Program at 1/2 Project request</li></ul>
<b>Planck</b>	<ul style="list-style-type: none"><li>- Fund US Support of 1-year extension of Low Frequency Instrument operations</li></ul>
<b>Spitzer</b>	<ul style="list-style-type: none"><li>- Extend ops thru FY14</li><li>- Closeout in FY15</li></ul>
<b>Suzaku</b>	<ul style="list-style-type: none"><li>- Extend US Science support through March 2015 (Astro-H launch +1 year)</li></ul>
<b>Swift</b>	<ul style="list-style-type: none"><li>- Extend mission operations thru FY16</li><li>- Augment Guest Observer Program per Project request</li></ul>
<b>XMM-Newton</b>	<ul style="list-style-type: none"><li>- Extend US support through March 2015</li></ul>

Note: All FY15 and FY16 decisions will be revisited in the 2014 Senior Review.



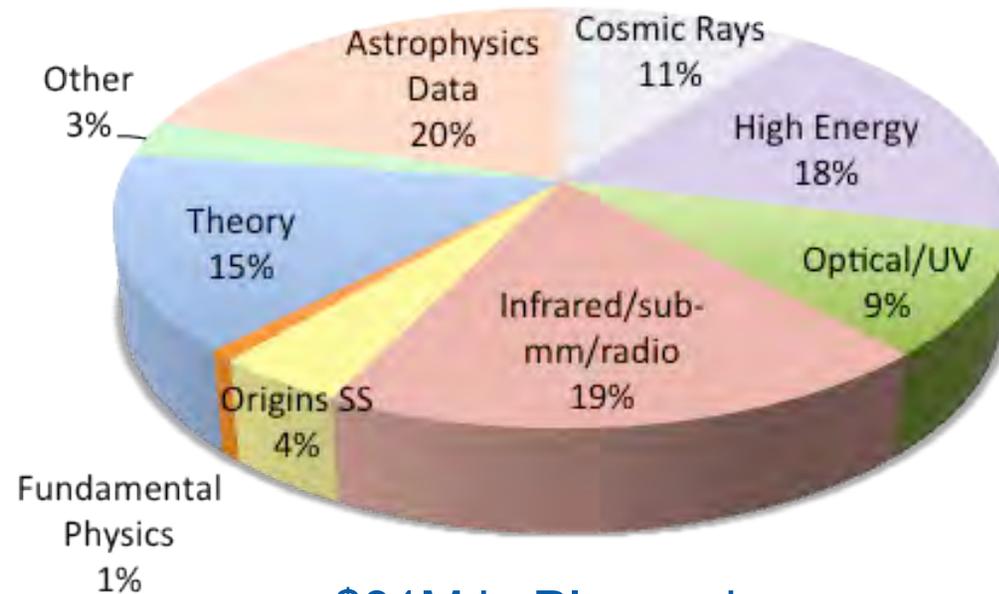
# Explorer Program

- FY13 budget request does not support an AO for both missions and missions of opportunity (MOs) in late CY12.
  - First priority is to complete Explorers in development: NuSTAR, SXS/Astro-H and operate Explorers in extended mission: Swift, Suzaku.
  - Second priority is to downselect and fund the development of one mission and one MO from the projects currently conducting Phase A studies (FINESSE/TESS, GUSSTO/NICER).
  - Third priority is to issue new AOs leading to new missions.
- The Astro2010 Decadal Survey said to “Enable rapid response to science opportunities; augments current plan by 2 MIDEXs, 2 SMEXs, and 4 MoOs.”
- Astrophysics Division is planning a series of AOs (subject to budget):
  - An AO for a MO with a \$50-60M cost cap in Sep/Oct 2012.
  - An AO for a SMEX in late-2013 with the cost caps and dates TBD by summer 2012.
  - An AO for a EX and MO in 2015/2016.



# Astrophysics Research Program Funding

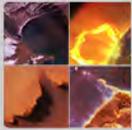
Spending in FY12



\$81M in PI award programs

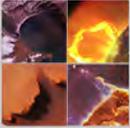


Funding for Research Award Programs: \$M



# ROSES Success Rates in Astrophysics

	Due Date	Rec'd	Selected	Success
<b>ROSES-2012</b>				
Astrophysics Theory	13-Jul-12			
Origins of Solar Systems	25-May-12	44		
Astrophysics Data Analysis	18-May-12	295		
<b>ROSES-2011</b>				
Strategic Astrophysics Technology	23-Mar-12	49		
Astrophysics Research and Analysis	23-Mar-12	162		
Elements with NEW STARTS IN FY13		550		
Fermi Guest Investigator – Cycle 5	20-Jan-12	224	67	30%
Kepler Guest Observer - Cycle 4	20-Jan-12	61	21	34%
Roman Technology Fellowships	18-Nov-11	16	3	19%
Swift Guest Investigator – Cycle 8	28-Sep-11	152	32	21%
Astrophysics Theory	3-Jun-11	197	33	17%
Origins of Solar Systems	27-May-11	36	5	14%
Astrophysics Data Analysis	20-May-11	278	60	22%
<b>ROSES-2010</b>				
Strategic Astrophysics Technology	25-Mar-11	56	18	32%
Astrophysics Research and Analysis	25-Mar-11	166	40	24%
Elements with NEW STARTS IN FY12		1186	279	<b>24%</b>



## Astrophysics Opportunities in ROSES-12

### DUE DATE

May 18, 2012

Astrophysics Data Analysis: ADAP

May 25, 2012

Origins of Solar Systems: OSS

July 13, 2012

Astrophysics Theory Program: ATP

August 31, 2012

Membership in Euclid Science Team

September 26, 2012

Swift Guest Investigator -- Cycle 9

November 1, 2012

Nancy Grace Roman Technology Fellowships  
(for early career researchers)

Winter 2012-3

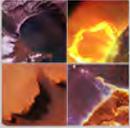
Kepler Guest Observer -- Cycle 5

January 18, 2013

Fermi Guest Investigator -- Cycle 6

March 22, 2013

Astrophysics Research and Analysis: APRA  
Strategic Astrophysics Technology: SAT

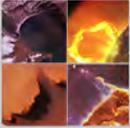


## New and Noteworthy in the Research Program

The [Nancy Grace Roman Technology Fellowship – new in 2011](#) – aims to develop future leaders for astrophysics flight instruments/projects. Early-career (<7 years since PhD) PIs in non-tenured positions may propose a [one-year concept study](#) to generate detailed plans and commitments for a [4-year development effort](#). Reports from concept studies are [peer-reviewed to select those that will continue to development](#). Under RTF-11 we selected 3 concept studies from 16 proposals.

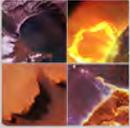
It's another big year for proposals to ADAP. The [Astrophysics Data Analysis Program received 295 proposals](#), up 6% on 2011. Newly available Kepler and WISE data have attracted much interest.

NSF and NASA expect to issue a joint solicitation for [FY13 funding of Theory and Computation Networks](#), as recommended by Astro2010. A report from AAAC recommends medium-scale 3-year efforts linking 3+ institutions.



# Astrophysics E/PO Portfolio

- **Astrophysics Science Education and Public Outreach Forum (SEPOF)** can help you share your science with educators, students, or the public (see <http://smdepo.org/node/305> ).
  - Contact email address: AstroForum@stsci.edu
- **Program Offices:** *Develop thematic initiatives reflecting the science and technology of the individual missions and the overall thematic elements of the program.*
  - PCOS and COR Program Offices are developing coordinated approach to PCOS and COR science E/PO.
  - Exoplanet Exploration Program Office has an established E/PO program which has been updated to reflect the current program.
  - Provide infrastructure for smaller E/PO efforts.
- **Flight Missions**
  - Every mission is required to have an E/PO plan.
  - Oversight provided by HQ Program Scientist, Program Executive, Astrophysics E/PO Lead.
- **Education and Public Outreach for Earth and Space Science (EPOESS)**
  - Competed through ROSES and funded by SMD.
  - Oversight provided by SMD and Astrophysics E/PO Lead.



# NIRCam to Launch “Girl Scouts” into Space Aboard JWST

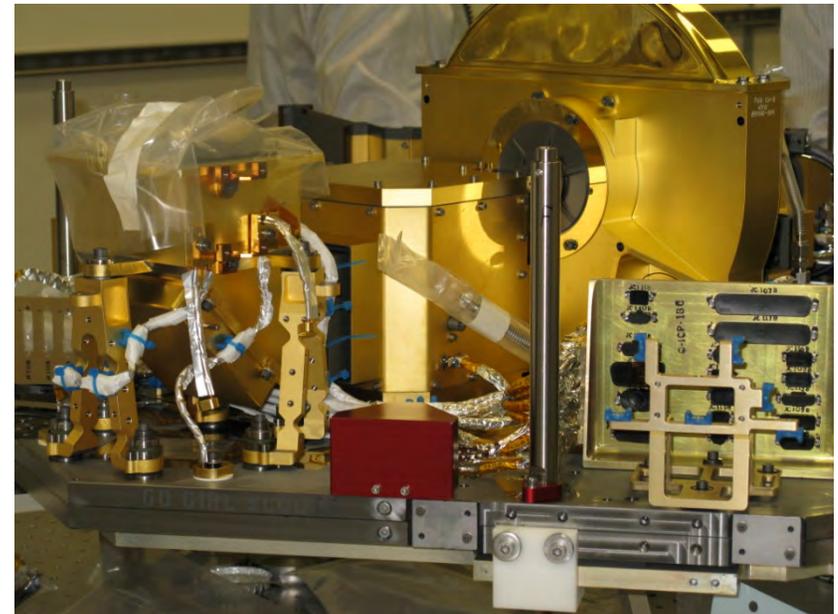
Since 2002, NIRCam’s scientists, educators, and engineers have partnered with the Girl Scouts of the USA to empower young women and girls in STEM subjects. Our “Train the Trainer” workshops have built a team of 225 GSUSA leaders who conduct science/math activities with their local troops. Together we use the excitement of NIRCam and JWST to teach valuable skills for use in daily life, in careers, and for good citizenship. Our newly completed (May 2012) flight modules will literally take “Girl Scouts” into space.

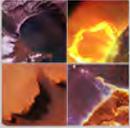


NIRCam’s beryllium optical bench is etched “Go Girl Scouts”.



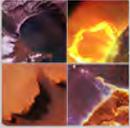
NIRCam’s optical bench with Girl Scouts in 2007 (left) and today (right) in a fully assembled flight module ready for final cryogenic testing.



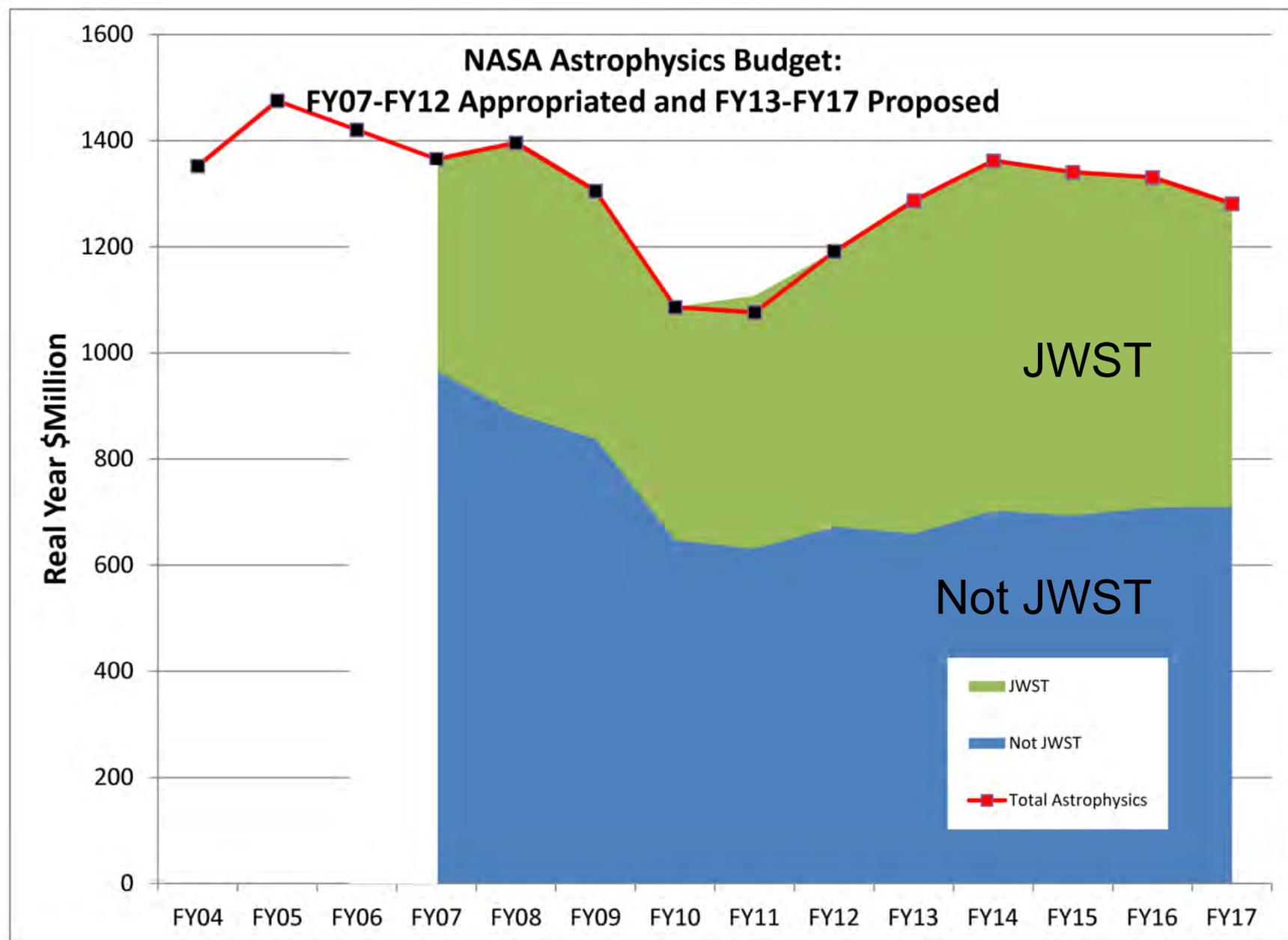


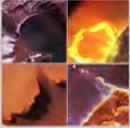
# WFIRST

- Science Definition Team delivered its interim report in July 2011.
  - The report is at: [http://wfirst.gsfc.nasa.gov/science/WFIRST\\_Interim\\_Report.pdf](http://wfirst.gsfc.nasa.gov/science/WFIRST_Interim_Report.pdf)
  - The first Design Reference Mission is a proof of concept that a mission can be constructed that is compliant with the Astro2010 recommendation.
  - Updated guidance given to Science Definition Team December 2011.
  - Second Design Reference Mission will not duplicate capabilities of Euclid, LSST, and JWST in advancing science objectives of WFIRST. Look for cost savings.
  - Final report due June 2012.
- Astro2010 recommended WFIRST as the highest priority large mission.
  - The President's FY13 NASA budget request includes no new large missions; Astrophysics expects none before JWST is successfully completed.
  - FY13 budget request does not support originally planned WFIRST technology development and includes no funding identified for WFIRST.
  - WFIRST will not launch in this decade (2018 + 7 yrs = 2025).
  - Astrophysics does not anticipate budget growth in the foreseeable future.
- NASA is proceeding as follows:
  - Through the Science Definition Team and Design Reference Missions, establish a basis for WFIRST planning.
  - Partner on ESA's Euclid to advance some of the science of Astro2010 and WFIRST.
  - Advance the technology and planning required for WFIRST as the budget allows.
  - Contemplate the use of the NRO telescopes for advancing WFIRST scientific priorities.



# President's FY13 Budget Request for Astrophysics





# Astrophysics Budget Strategy

2012

- Study WFIRST options.
- Solicit ideas from the community for studies of moderate missions that address DS priorities.
- Establish community study teams for mission concepts.
- Initiate mission concept studies within the programs.
- Use community analysis groups to inform process.

2013

- Use competed and directed technology programs to develop enabling technology and mission concepts.

2014

- Continue

2015

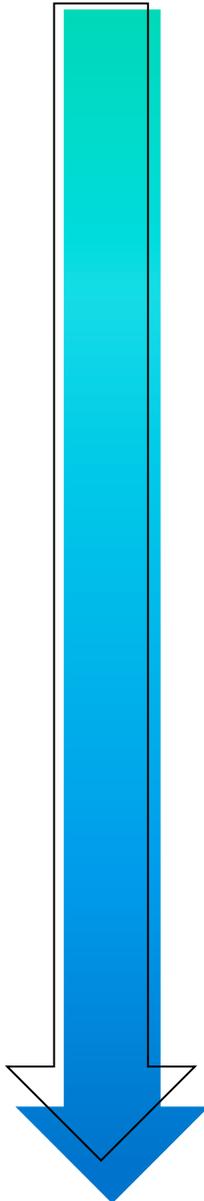
- Using community input, conduct prioritization and decision process for identifying FY17 new start.
- Start pre-formulation for new FY17 strategic mission.
- Start NRC mid-decade review.

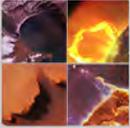
2016

- Complete mid-decade review. Revise plans as necessary in response to report.

2017

- New start for strategic mission.





## Astrophysics Division Attending AAS

Richard Griffiths

Hashima Hasan

Doug Hudgins

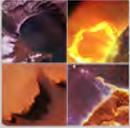
Mario Perez

Larry Petro

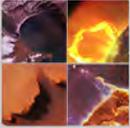
Rita Sambruna

Linda Sparke

Glenn Wahlgren



# Backup Slides



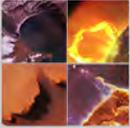
## Theory & Computation Networks: Decadal Priority

Astro2010 recommended that NASA, NSF and DoE jointly provide \$9.5M/year for 5-year awards to Theory and Computation Networks that address major theoretical questions raised in Astro2010 that are ripe for a breakthrough.

In October 2011, NASA Astrophysics and NSF AST asked AAAC to consult with community experts on how the cross-agency program recommended in the 2010 Decadal Survey could usefully be formulated. Their May 2012 report recommended:

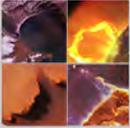
- With ~\$2M/year available, multiple 'medium-scale' 3-year awards would be most useful.
- A network should involve collaboration across 3+ distinct institutions.
- Networks should address key questions in astrophysics, not limited to those called out in Astro2010.

NSF and NASA expect to issue a joint solicitation for a first round of awards to begin in FY2013.



# Astrophysics Program Structure

- Physics of the Cosmos
  - Strategic missions and research to answer “How does the universe work?”
- Cosmic Origins
  - Strategic missions and research to answer “How did we get here?”
- Exoplanet Exploration
  - Strategic missions and research to answer “Are we alone?”
- Explorer Program (Astrophysics)
  - Smaller, competitively-selected, Principal Investigator-led missions (shared with the Heliophysics program)
- Astrophysics Research
  - Competitively-selected sponsored research to enable Astrophysics missions



# Physics of the Cosmos Program

## PCOS Program Objectives

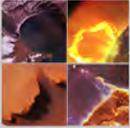
The objective of the PCOS program is to understand how the universe works starting with the very basic building blocks of our existence - matter, energy, space, and time - and how they behave under the extreme physical conditions that characterize the evolving universe. The PCOS program incorporates cosmology, high-energy astrophysics, and fundamental physics projects aimed at addressing directly central questions about the nature of complex astrophysical phenomena such as black holes, neutron stars, dark energy, and gravitational waves.

## Program Elements

- Projects in Operations: Chandra, Fermi, Planck, XMM-Newton
- Project in Development: ST-7
- Explorer missions with PCOS Science
  - Projects in Operation: Suzaku, Swift, RXTE. WMAP in data analysis phase.
  - Projects in Development: GEMS, NuSTAR, Astro-H
- Einstein Fellowship - Supports recent Ph.D.'s in astronomy, physics and related disciplines for research that is broadly related to the NASA Physics of the Cosmos program as addressed by any of the missions of this program.

**Program Office:** GSFC

**Website Link** - <http://pcos.gsfc.nasa.gov/>



# Cosmic Origins Program

## **COR Program Objectives**

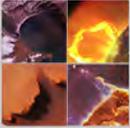
The objectives of Cosmic Origins Program are to discover how the universe evolved from free electrons and protons into complex structures like galaxies, stars, and planetary systems. Expand scientific understanding of the Earth and the universe in which we live; discover how the universe works, explore how it began and evolved, and search for Earth-like planets.

## **Program Elements**

- Projects in Operations: Hubble, Herschel, Spitzer
- Explorer missions with COR Science
  - Project in Operation: GALEX. WISE in data analysis phase
- Hubble Fellowship - Supports outstanding postdoctoral scientists whose research is broadly related to NASA Cosmic Origins scientific goals as addressed by any of the missions in that program.

**Program Office:** GSFC

**Website Link:** <http://cor.gsfc.nasa.gov>



# Exoplanet Exploration Program

## ExEP Program Objectives

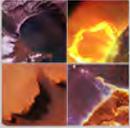
The primary goal of the Exoplanet Exploration Program is to discover and characterize planetary systems and Earth-like planets around nearby stars. The scientific investigations and the missions that carry them out are designed to build on each other's success, each providing an essential step forward toward the goal of discovering habitable planets and evidence of life beyond.

## Program Elements

- Projects in Operations: Kepler, Keck Interferometer
- Projects in Development: LBTI
- Pre-Phase A: WFIRST
- NASA Exoplanet Science Institute
- Technology development
- Sagan Fellowship - Supports outstanding recent postdoctoral scientists to conduct independent research that is broadly related to the science goals of the NASA Exoplanet Exploration program.

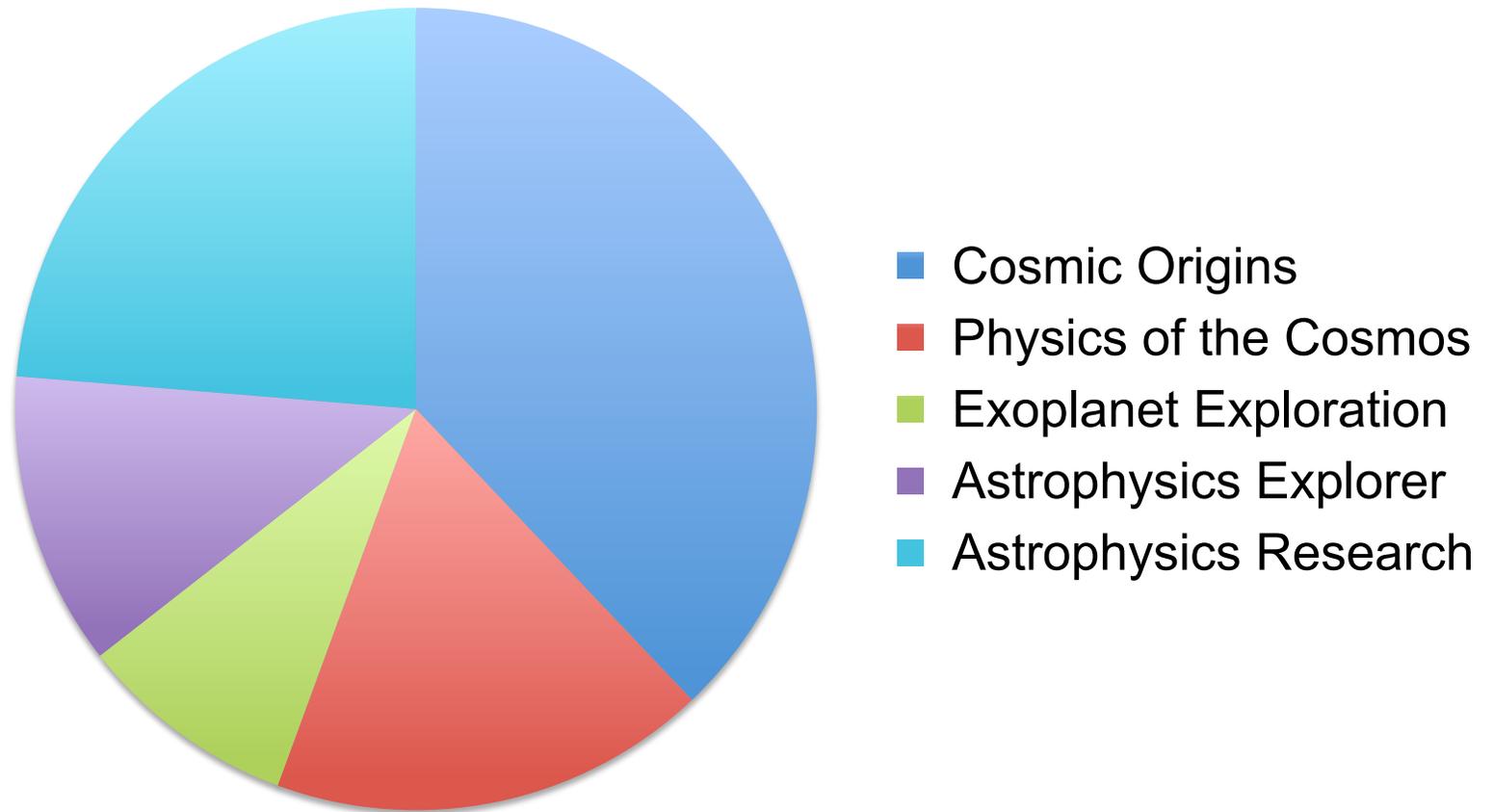
**Program Office:** JPL

**Website Link:** <http://exep.jpl.nasa.gov/>

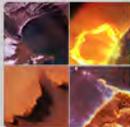


# FY2013 President's Request for NASA Astrophysics

~\$633M Total \*

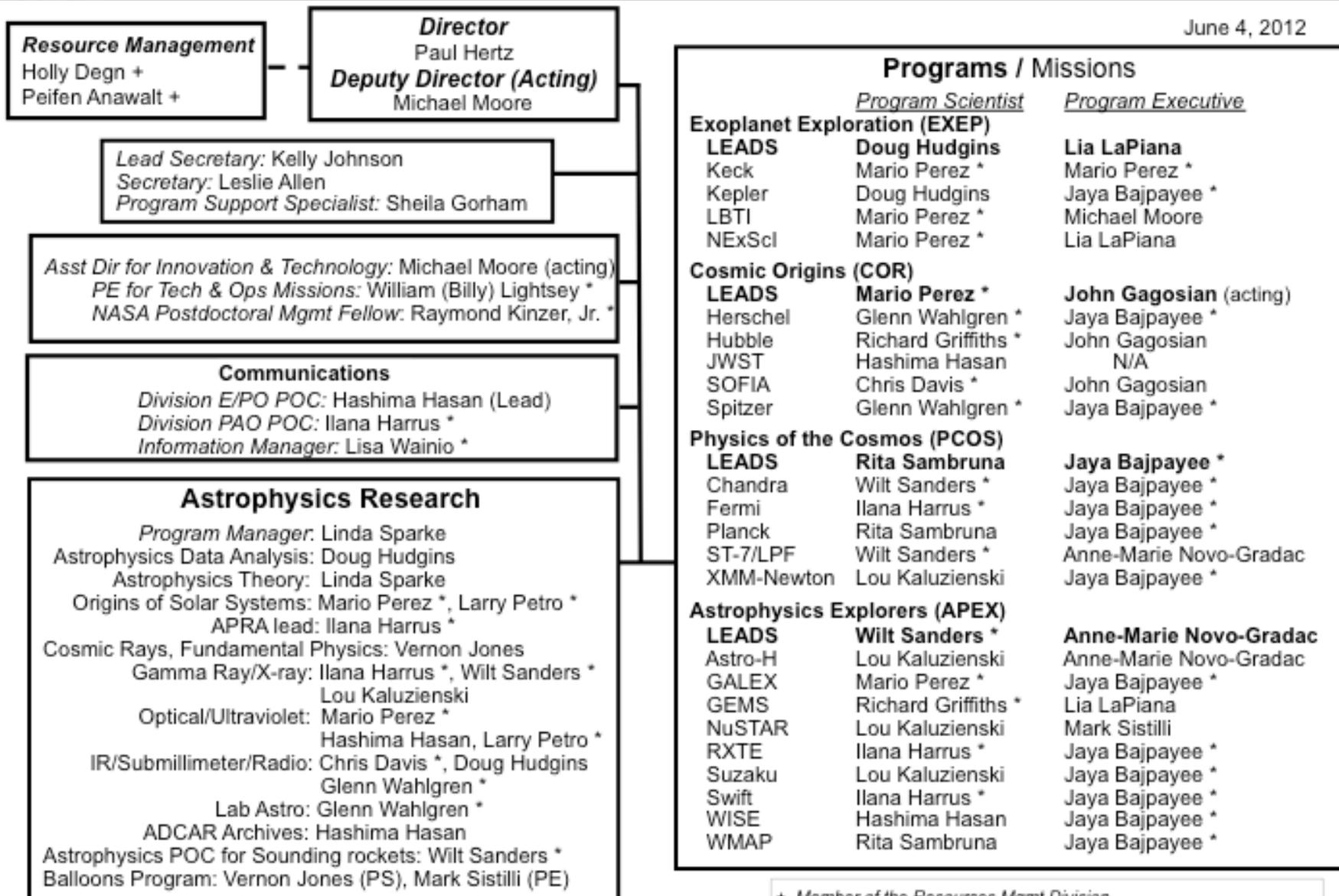


\* Does not include SMD budgets that are bookkept in the Astrophysics budget line



# Astrophysics Division Organization Chart

June 4, 2012



+ Member of the Resources Mgmt Division  
\* Detailee, IPA, contractor, or NASA Postdoctoral Mgmt Fellow  
JWST now part of the JWST Program Office.